BIAZA
BRITISH & IRISH ASSOCIATION OF ZOOS & AQUARIUMS

Zoo Research News

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News and Views from the BIAZA Research Committee

Report from the Native Species Working Group and Field Programmes Conference

Overlapping conferences of the Native Species Working Group (NSWG) and Field Programmes Committee (FPC) were hosted by Beale Park in September (NSWG 13th & 14th; FPC 14th & 15th).

The NSWG part as ever, had a strong emphasis on the practical side of things to introduce delegates to new experiences and encourage greater participation in national survey schemes. This year there was a focus on woodland management, bird ringing and bat identification. A central theme for the Native Species Working Group is the promotion of site management for native species. Zoos manage large tracts of land with a wide array of habitats and species all with huge potential for nature conservation. Dave Coles from Beale Park presented species lists from several BIAZA members showing high proportions of species of conservation importance present on zoo sites. Collation of these records enables us to present BIAZA as a large native wildlife conservation body. On a site level surveys can inform management and site enhancement. Natasha Hambly from Flamingo Land reported on how this has been achieved through the development of a site BAP (Biodiversity Action Plan). This is something NSWG wishes to support through guidelines for BIAZA members on how to go about this process.

The FPC conference concentrated largely on the successful management of field programmes. The first day looked at various methods of adaptive management for conservation projects and how to evaluate their success. We were lucky enough to have Ilke Tilders from the Foundations of Success to lead a workshop on the Open Standards of Conservation Practice and the use of Miradi software to help put these standards into operation. Also Simon Black from DICE, University of Kent, gave a presentation on a complementary system of evaluation, the Model of Conservation Excellence. Most zoos clearly have much to do to ensure effective evidence-based conservation practice and we need research input to achieve this. On the second day we held a workshop on guidelines for BIAZA collections on how to go about developing field conservation programmes. This was prefaced by an evaluation of the current commitment to field conservation based on responses to the Annual Questionnaire (see the feature article, this issue). This analysis will be carried out on an ongoing basis to monitor improvements in conservation inputs – and possibly, in future years, conservation outcomes.

Journal of Zoo and Aquarium Research

The BIAZA Research Committee, together with colleagues from the EAZA Research Committee, has been working all year to launch a new journal covering all areas of zoo based research. We have now had great news from the EAZA annual meeting that EAZA have allocated a budget to the *Journal of Zoo and Aquarium Research* which we are now confident can be launched in 2012. We hope the new journal will provide a forum for rapid publication of papers covering the full range of fields and types of zoo and aquarium-based research. It will include novel, peer-reviewed research papers, reviews, technical reports, case studies, short reports and reports on evidence-based practice – ie applying the best available evidence gained from the scientific method to decision making. The vision of this evidence-based section is that the assessment, documentation and dissemination of the effectiveness of husbandry interventions will become a routine part of zoological management practice. Research categories covered by the *Journal of Zoo and Aquarium Research* will include studies in pure and applied biological sciences (e.g. behaviour, genetics, medicine, nutrition, population management and reproduction) that have been undertaken in zoos or have relevance to zoos, *in situ* conservation research (e.g. socio-economic and field surveys) and research aimed at developing other zoo roles (e.g. visitor learning, evaluation of education activities, sustainability and marketing surveys).

We would encourage all readers to consider submitting papers to this journal so together we can create a high quality, peer-reviewed journal that will truly reflect the many varied forms of research conducted in modern zoos . In the first instance manuscripts should be sent to Dr Amy Plowman (address at end of this newsletter), guidelines for authors are available on request and a website will soon be created to give further information.

Field conservation by BIAZA zoos: how well are we doing?

Andrew R. Marshall and Nicolas Deere, CIRCLE (University of York and Flamingo Land Ltd.)

Introduction

The Field Programmes Committee (FPC) is one of the new BIAZA committees established in 2011 to replace the Conservation and Animal Management Committee. Its aims are to:

- Encourage, facilitate and monitor national and international *in situ* conservation work of members
- Promote *in-situ* conservation work of members to public, governments, NGOs and other external bodies such as potential funders
- Encourage and facilitate partnerships and networking in order to support effective collaborative conservation initiatives
- Encourage an environmentally sustainable approach, raise climate change awareness and provide guidance to members

Using data gained from the BIAZA Annual Questionnaire (AQ) this study aimed to assess the current status of *in situ* conservation work by BIAZA members and set a baseline for future evaluation of the first three of the FPC's aims. We also hoped to identify specific activities that could be undertaken by the FPC to achieve its aims.

Annual Questionnaire questions

The following questions regarding *in situ* conservation are included in the AQ:

- Does your collection support field conservation?
- Do you have staff whose sole responsibility is field conservation work and/or staff who have field conservation as part of their responsibility? In each case how many full and part-time staff?
- How many field conservation projects (UK/overseas) did you support last year?
- How much money did you invest directly in field conservation support?
- How much monetary value in staff time did you invest in field conservation support?
- List all field conservation projects

Completion of the AQ is an obligation of BIAZA membership and should be done in Jan/Feb with complete data from the previous calendar year. The responses to these questions for the years 2009 and 2010 were analysed and compared, however 2010 results are still preliminary as only 60% of collections had returned the 2010 AQ at the time of the study (July 2011). The response rate for 2009 data was 96%. Any differences found between 2009 and 2010 results can therefore only be tentative.

Results

In 2009 88%, and in 2010 92%, of BIAZA members said they supported field conservation projects (Fig. 1) and 82% and 86% (2009 and 2010 respectively) of members employed full and/or part time staff members whose responsibilities were totally or partially field conservation work. In 2010 only 10 collections employed at least one full time member of staff whose sole responsibility was field conservation. In 2009 and 2010 respectively the average number of full time field conservation staff was 0.7 and 1.45 and of part time field conservation staff was 1.6 and 1.5

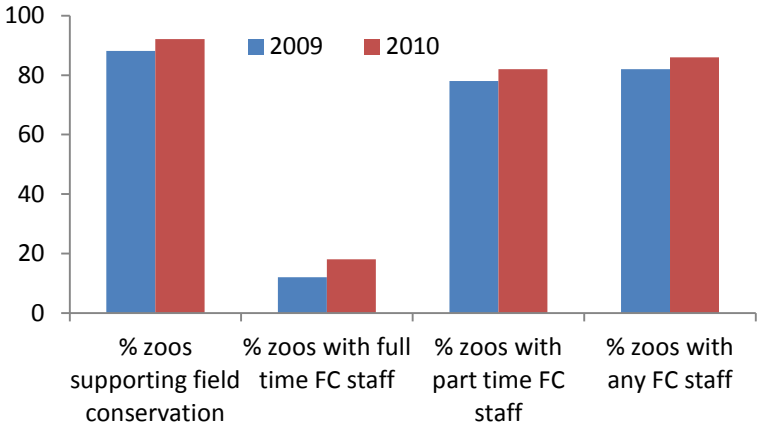

Figure 1. BIAZA members supporting field conservation projects and employing field conservation staff

The average number of projects supported per collection was 9.5 and 10.9 (2009 and 2010 respectively) of which the majority were overseas rather than native species (Fig. 2) and there was large variation between collections. There was also huge variation in the financial contributions to field conservation projects (Fig. 3), from less than £1,000 to over £600,000 in 2010, with average amounts of approximately £160,000 and £275,000 in 2009 and 2010 respectively. The AQ also includes a question on total income so we were able to express field conservation support in terms of % of total income; on average this was 4.3% and 8% respectively in 2009 and 2010.

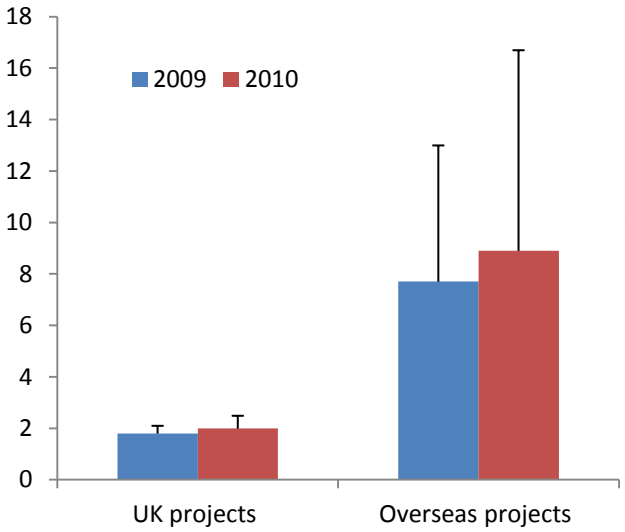

Figure 2. Average number of field conservation projects supported by BIAZA members

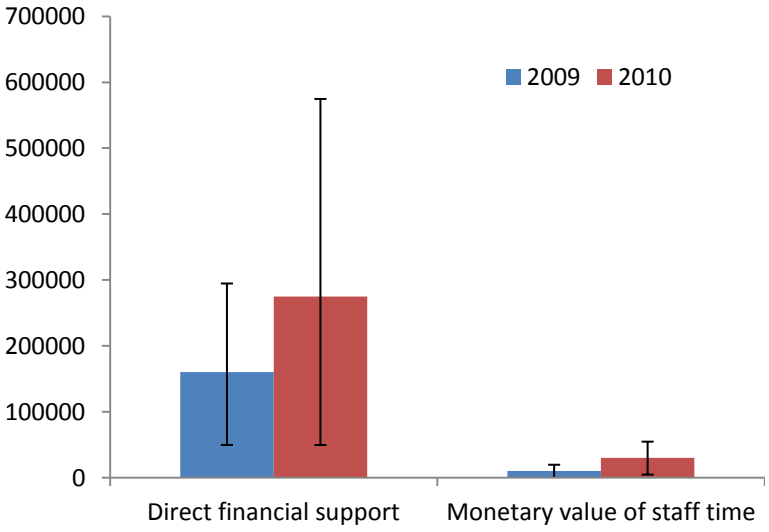

Figure 3. Financial contributions of BIAZA members to field conservation projects

Discussion

It is clear from the AQ responses that there is a large variation in both the capacity for and commitment to field conservation projects across BIAZA members. It appears that generally BIAZA members are moving in the right direction with greater contributions in 2010 than 2009, however this may not be indicated once the complete dataset for 2010 is available. In both years a small number of collections stated they were not supporting field conservation projects, despite the legal requirement to do so (SSSMZP, 2000). It is possible that these collections do in fact support field conservation but do not realise that their activities fit this criterion. Since this is only a small number these collections could be contacted directly to confirm whether or not they do contribute to field conservation. There is a guidance document available on the BIAZA website to illustrate what is included as "conservation" in this context but it is unclear how many collections refer to this as they complete the AQ and also how workable the definitions given in it are when trying to provide accurate estimates of financial contributions (see http://www.biaza.org.uk/resources/library/images/contributions%20to%20FC%20dec08.pdf). The list of field project titles provided by zoos suggests that many do not use this guidance and/or there is considerable variation in how the guidance is applied.

The variety of responses to many of the questions suggests that, in addition to real differences between collections in their contributions to field conservation, there are inconsistencies in interpreting the questions. For instance, in response to the question regarding the monetary value of staff time spent on field conservation one collection stated £150 whereas another stated over £2million. This vast difference suggests that they are using very different methods to evaluate staff time. Another ambiguity mentioned by some respondents is that it is not clear to them who counts as "staff" for the purposes of the questionnaire. Many zoos fund full time conservation positions via a partner organisation – should these be counted as zoo staff if they are not technically employed by the zoo but have their salaries fully paid by the zoo? The FPC clearly needs to review the questions and guidance document in order to improve consistency in recording conservation inputs across collections. The current AQ questions attempt to measure the conservation inputs of members and make no attempt to evaluate how good any of the conservation projects are. This would be a very difficult task and is probably outside the scope of the AQ. However, there could be some questions that relate to how the collections themselves evaluate their conservation projects; do they have a formal evaluation procedure, are they using any well recognised indicators of success, have they adopted recognised standards of conservation practice?

Despite difficulties with consistency it is clear that many BIAZA collections make very significant inputs into field conservation and have considerable staff expertise. Others clearly do less and need strategic help to convince senior management of the importance of field conservation, to form links with other zoos, universities and NGOs to access the expertise they may lack, to understand funding requirements and how to achieve and maintain external funding partners, to maximise the PR potential of projects etc. The FPC needs to identify ways to spread best practice to assist all members to achieve their full potential in this area. Its success will be monitored by ongoing review of the AQ conservation section responses in future years.A more in-depth analysis of the annual data is underway and will be available in 2012.

References

SSSMZP 2000. Secretary of State's Standards of Modern Zoo Practice. DEFRA http://www.defra.gov.uk/wildlife-pets/zoos/standards-zoo-practice/

Research Snippets

What's new in zoo research – a quick look at recent publications

Prof Geoff Hosey, University of Bolton (gh2@bolton.ac.uk)

Probably most of the readers of this column (assuming, that is, that anybody reads it!) enjoy visiting zoos. If you are one of those, then you are in good company, as a recent survey by Markus Gusset and Gerald Dick of WAZA shows that over 700 million people throughout the world visit zoos and aquariums each year (*Zoo Biology* 30: 566-569, Sept/October 2011; doi: 10.1002/zoo.20369). This, as the authors point out, gives the zoo and aquarium community a lot of potential to educate people about conservation and environmental issues. How well do they do that? If zoo websites are anything to go by, it seems that the answer is 'not very well'. The websites of 54 zoos worldwide were subjected to content and semiotic analysis by Neil Carr and Scott Cohen of Otago University, who found that although the conservation message was there, it lacked depth, and that the strong message coming across was about the zoo as entertainment (*Anthrozoös* 24: 175-189, June 2011; doi: 10.2752/175303711). The conservation message is an important one to get across, and websites are likely to be a first port of call for anyone intending to visit a zoo, so many of these websites clearly need to be beefed up a bit. What about people's perceptions during a visit? In a forthcoming paper Lance Miller of San Diego Zoo investigates visitors' perceptions of tigers showing pacing behaviours (*Zoo Biology* in press; doi: 10.1002/zoo.20411). Respondents' scores were significantly lower for questions asking about their perceptions of the standard of care in zoos, and also for questions asking about their support for zoos, in the group which had seen a 15-second video of tigers pacing, compared to those who had seen a video of a tiger resting.

Stereotypies like pacing, of course, might be telling us as much about the animal's past environment as about its current one, so it is by no means clear that they indicate a current welfare issue. This makes studies like that of Lucy Birkett and Nicholas Newton-Fisher of the University of Kent rather more difficult to interpret. They surveyed 40 chimpanzees across six different zoos, and reported that all 40 of them showed some abnormal behaviour (*PLoS One* 6 [6] e20101, June 2011; doi: 10.1371/journal.pone.0020101). A further problem for interpretation is that the most prevalent (0.83, which means about 33 of the animals showed it) abnormal behaviour was eating faeces, which, as the authors point out, has also been reported from at least six wild populations, so we are left wondering if this really is an abnormal behaviour. In a similar vein, Lance Miller has documented a behaviour in wild lemon sharks *Negaprion brevirostris* which looked very like a repetitive, hence stereotypic, swimming pattern (*Zoo Biology* 30: 365-370, July/August 2011; doi: 10.1002/zoo.20347). As he points out, if this occurred in a zoo it would be regarded as a stereotypy, but "abnormal" behaviours are partly defined on the basis that they are not observed in the wild. So, is it abnormal or not? Ditto faeces eating in chimpanzees.

One of the features of captive environments which have often been presumed to cause abnormal behaviours is forced proximity to conspecifics. Crowding in particular has been proposed to cause hyper-aggression and other abnormal behaviours, though the evidence is somewhat ambiguous, possibly because there isn't much of it. Now Katherine Leighty and colleagues at Disney's Animal Kingdom have monitored changes in tiger behaviour during periods when they were housed in groups of different sizes and had reduced access to an outdoor enclosure which was undergoing reconstruction work (*Zoo Biology* 30: 479-486, Sept/October 2011; doi: 10.1002/zoo.20349). During this period the rates of aggression and affiliation in the tigers decreased significantly, which is contrary to the predictions of density related aggression and tension reduction models of crowding, and supports instead the conflict avoidance model, which suggests that the animals avoid social interactions generally when in forced proximity, and which is similar to what has been reported for chimpanzees. Another way of investigating group-size effects is to look at faecal glucocorticoid levels, and this has now been done for 111 orangutans across 29 European zoos by Tony Weingrill of the University of Zurich and colleagues (*General and Comparative Endocrinology* 172: 446-457, July 2011; doi: 10.1016/j.ygcen.2011.04.008). They found that Bornean orang-utans showed a steeper increase in glucocorticoid levels with increasing group size than Sumatran orang-utans, which suggested that Sumatran animals are better able to adapt to social housing than the Bornean animals, and was in keeping with predictions made from knowledge of the life history differences in the two species in the wild.

Bringing animals into captivity can also lead to increases in corticoids. A study by Edward Narayan and colleagues at Griffith University on captured cane toads (admittedly not everyone's idea of a deserving zoo animal) showed that elevated urinary corticosterone metabolite persisted for at least five days in communally housed toads, and that corticosterone levels were more variable for captive than wild toads (*General and Comparative Endocrinology* 173: 371-377, September 2011; doi: 10.1016/j.ygcen.2011.06.015). And while we're on the subject of amphibians, Matthew Chatfield and Corinne Richards-Zawaki of Tulane University have recently demonstrated that after maintaining bullfrogs and cricket frogs infected with *Batrachochytrium dendrobatidis* at a temperature of 30°C for ten days, only one of 28 frogs was still infected (*Diseases of Aquatic Organisms* 94: 235-238, May 2011; doi:

10.3354/dao02337). The demonstration that something as straightforward as raising the ambient temperature could combat this awful infection is encouraging.

Finally, I have to tell you about a tool-using mandrill at Chester Zoo, observed by Riccardo Pansini and Jan de Ruiter of Durham University (*Behavioural Processes* 88: 53-55, September 2011; doi: 10.1016/j.beproc.2011.06.003). This animal makes and uses splinters to clean beneath his toe nails. I love things like this. I've no idea if mandrills do this in the wild; if they do, then it emphasises the potential of zoos to give us glimpses of behaviours that are difficult to see in the wild; if they don't, then it shows how the zoo provides exciting challenges for an innovative animal. Either way, it extends the range of tool making and tool using species well into the cercopithecines. Oh, and fruit bats can follow human pointing to find a source of food, an ability previously thought to be unique to humans [and maybe dogs] (N.J.Hall *et al*., *Journal of Comparative Psychology* 125: 341-346, August 2011; doi: 10.1037/a0023680); but I haven't space to tell you about that. I'd better stop now before I get tempted to tell you about the mosquitos that live in zoos in South Carolina (just in case you want to read it, it's in *Journal of the American Mosquito Control Association* 27: 111-119, June 2011; doi: 10.2987/10-6061.1).

Stress in captive California sea lions: analysis of behaviour and establishment of a salivary cortisol baseline

Maria Smithies and Dr John Williams, University of Southampton.

By monitoring both behavioural and physiological changes in captive California sea lions, we can begin to understand the impact of potential stressors associated with life in captivity. This study had two objectives, first to assess the impact stressors within the park had on sea lion behaviour. Secondly, to test a method of salivary cortisol collection and establish a preliminary baseline which future studies can use to link behavioural changes with salivary cortisol fluctuations. Behaviour of three captive California sea lions in West Midlands Safari Park was observed with respect to changes in the potential stressors noise and visitor numbers, both of which vary throughout the day as well as between the park's open and closed season. Cortisol is a well-known stress hormone that has been used previously to monitor stress in California sea lions. However, previous investigations have looked at cortisol in serum rather than saliva. In this study salivary cortisol was obtained in favour of serum cortisol due to the simple, stress-free and non-invasive nature of the collection procedure. Saliva samples were taken from two juvenile California sea lions, three times of day, during the morning, mid-day and afternoon, for 14 days.

The proportion of time the youngest sea lion spent 'observing' his surroundings significantly increased (P=0.001) during periods of high visitor numbers (55.27%) compared to low visitor numbers (18.19%). However, this is more likely a result of associating visitors with food rather than increased vigilance indicating stress. The dominant male sea lion showed no increase in observational behaviour, but instead continuously swam around the perimeter of the pool - probably a territorial behaviour. The two juvenile sea lions spent significantly more time interacting with each other when the park was open (P=0.001), suggesting visitors had a positive effect on their behaviour by increasing their 'play' time. The differences in behaviours between the sea lions could potentially be a result of differences in age and time spent at the park. No significant variation was seen in salivary cortisol across time of day for either sea lion (P=0.167; P=0.361) or between sea lions (P=0.177) and therefore a baseline value of salivary cortisol was calculated from an average of these values giving a value of 2.67 ± 0.25ng/mL. From this, a serum cortisol value of between 76.27± 7.05ng/mL and 127.12 ± 11.75ng/mL was estimated, which is similar to that of wild and captive California and Steller sea lions. This indicates a robust method of collection which will allow future behavioral studies to be conducted, alongside physiological studies, so as to better monitor the stress levels of captive California sea lions.

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Preorbital scent-marking periodicity in blue duikers in different social settings

Brighton Msimanga, National University of Science and Technology, Bulawayo and Nicky Pegg, Dambari Wildlife Trust, Bulawayo

Preorbital scent gland marking is a territorial behaviour carried out by both male and female blue duikers (*Philantomba monticola*). This study sought to determine (i) whether differences in scent marking rates were evident between sexes, and (ii) at what times during peak activity periods (morning or evening) territorial behaviours were displayed. Six enclosures housing singletons (N = 2), pairs with offspring (N = 1), same-sex adults (N = 1) and adults with immature animals (N = 2) were used. Morning and evening sessions were divided into 10-minute intervals, and a focal-group method was used. Observations were made during known activity

periods (05:00 to 08:00 and 16:00 to 19:00) over 18 days so that every enclosure was observed in each time interval three times (i.e. three replicates per 10-minute time interval). The number of minutes dedicated to various activities was recorded. Activities included "active" (including investigation, foraging, etc), "rest/rumination" (i.e. stationary), or "grooming". If the animal was not visible, it was recorded as out of sight. Any scent-marking was recorded, including the time at which scent-marks were deposited, the structure to which they were applied and the number of scent-marks deposited. To correct for time out of sight, behaviours were reported as the number of events per time visible or per time active.

The following trends were evident from preliminary analysis:

- Preorbital scent-marking rate was significantly higher in the evening than in the morning (paired *t*-test; $t = 4.87$, $p = 0.009$, Table 1).
- Scent-marking appeared to be loosely correlated with moon phase, with a 2-week periodicity. Higher evening marking rates occurred around new and full moons.
- Preorbital scent-gland pressing (i.e. animals marking each other) occurred at the highest frequency between mated individuals (mean 3.4 times/hr visible), compared with a mature male and an unrelated female on the cusp of sexual maturity (2.2 times/hr visible), a pair of sisters (0.19 times/hr visible) and dam-immature offspring (0.08 times/hr visible). This suggests a bonding or mate guarding function.
- Mature individuals sharing a territory appeared to share scent-marking duties (Table 1) as indicated by lower marking rates per individual compared with sole territory holders. This may have an energy-saving function, given that manufacture of scent secretions is energetically expensive: i.e. a parsimony hypothesis. Replicates were limited, but the individuals of the breeding pair generally marked different structures; that is marking on top of the scent of their companion was rare. This lends additional weight to the parsimony hypothesis, rather than the mate-guarding hypothesis in which overmarking indicates to intruders that an individual has a mate. Immature animals (< 12 mo) never scent-marked.

Table 1: Mean preorbital marking rate (no. deposits/ minute active) in morning and evening sessions for different social groupings of blue duikers.

Arrangement	Male		Female	
	Morning	Evening	Morning	Evening
Single adult (with/ without immature pen mate)	0.33	0.39	0.20	0.22
Same-sex adults			0.13	0.18
Breeding pair	0.22	0.27	0.09	0.13

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Announcements

4th Annual Symposium BCSF/ PSGB Winter Meeting, 1st Dec 2011: Primate Ecology and Forest Conservation

The Bristol Conservation and Science Foundation 4th Annual Symposium will be held jointly with the Primate Society of Great Britain (PSGB) Winter Meeting. The theme Primate Ecology and Forest Conservation unites the 2011 UN International Year of Forests and the EAZA Ape Campaign. The symposium will bring together experts on both primate and forest conservation, to assess the role of primates for ecosystem functions and forest regeneration, as well as the nature and speed of global deforestation. The symposium will also explore how appropriate species conservation programmes and alternative land management practices can go hand in hand to preserve primate populations and their forest ecosystems. The one-day symposium will be held in the Clifton Pavilion at Bristol Zoo Gardens, starting at 9.45 am and finishing at 5.30 pm. Registration fees are PSGB student member: £25.00, PSGB full/associate member/BCSF staff: £55.00, Student non-member: £40.00 and Non-member: £70.00. Fee includes a buffet-style lunch as well as coffee/tea breaks between the sessions and entry to Bristol Zoo Gardens. To find out more, please email Charlotte Bryant - cbryant@bristolzoo.org.uk. To register or to submit a poster please check our website http://www.bcsf.org.uk/bcsf/annual-symposium or send an email to Sue Dow - sdow@bristolzoo.org.uk.

Your contributions are needed

Please send articles, announcements, comments or other feedback for the next issue by the end of Dec to:

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